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Economic Impact of Avian Flu

Global Program for Avian Influenza and Human Pandemic



Evidence shows that the H5N1 strain of Highly Pathogenic Avian Influenza (HPAI) is now endemic in parts of South-east Asia, where Cambodia, Indonesia, Laos, Thailand and Indonesia are the worst-affected countries. The continuing outbreaks that began in late 2003 and early 2004 have been disastrous for the poultry industry in the region; by mid-2005, more than 140 million birds had died or been destroyed and losses to the poultry industry are estimated to be in excess of US\$10 billion.

Despite control measures, the disease continues to spread and to raise serious public health concerns at the global level. The major world animal and human health

authorities (FAO, OIE and WHO) are collaborating closely on a global strategy and regional and country-specific plans, the overall goal of which is to minimize the global threat of HPAI to human and domestic poultry and other animal populations through the control and gradual eradication of HPAI.

HPAI is mainly an animal health problem, although more than half of the 120 human cases have been fatal. However, it is widely believed in the scientific community that a global pandemic of human influenza is both overdue and inevitable. Such a pandemic would be the result of the emergence of a strain of virus to which the world's population had little or no immunity.

A widespread epidemic need not be severe or particularly deadly; the pandemics of 1957-1958 and 1968-1969 were relatively mild. However, there is the possibility that the H5N1 strain could, through genetic re-assortment or a more gradual process of adaptive mutation, become readily transmissible from human-to-human and become the basis of a global pandemic comparable to that of 1918-1919, the "Spanish" influenza, which recent research has shown to have had its origin in an avian influenza virus.

The situation faced by individual countries is characterized by both urgency and uncertainty. Warnings that a pandemic may occur have come from both changes in the epidemiology of the disease in human and animal populations and the expanding geographical spread of the virus that creates ever-widening opportunities for human exposure. Neither the timing nor the severity of the next pandemic can be predicted but with the virus now endemic in bird populations the risk will not be easily diminished. There is a major opportunity for international and coordinated intervention, and it is in the interests of all countries to delay the emergence of a pandemic virus and its spread in order to augment the supply of vaccine.

There is a dilemma in preparing for a potentially catastrophic but unpredictable event, especially for those countries currently affected by the H5N1 virus outbreaks in animal and human populations. It is clear, however, that containing and eradicating the virus would be a desirable objective even if the problem were restricted to one of animal health in a given country. The global public health implications of the potential emergence of the virus as the next human influenza pandemic make coordinated action essential.

Those countries with endemic HPAI of the H5N1 strain must sustain (and perhaps intensify) resource-intensive activities and shoulder the burden of economic losses in part to safeguard international public health. Assisting them with the financial costs of so doing is clearly an international responsibility.

WHO has prepared a global plan and guidelines for pandemic preparedness and is developing a model country plan that will allow countries to assess their state of preparedness and identify priority needs. The WHO strategy has five strategic actions, summarized as follows:

WHO Global Plan for Pandemic Preparedness	
Phase	Strategic Action
Pre-pandemic	1. Reduce the opportunities for human infection 2. Strengthen the early warning system

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Emergence of pandemic virus	3. Contain and/or delay the spread at source
Pandemic declared	4. Reduce morbidity, mortality and social disruption 5. Conduct research to guide response measures

In close coordination, WHO, FAO and OIE have prepared a global strategy for the progressive control of HPAI which is a *"master coordination plan ... defining ... short, medium and long term priority activities, to be endorsed and supported by individual countries and regional organizations ..."* which is to be complimented by more detailed country-specific HPAI control plans, the preparation of which is being technically supported by the FAO.

This global strategy, in effect, addresses the WHO's two strategic actions in the pre-pandemic phase. The immediate and short-term objective is to prevent further spread of HPAI in those countries that are currently infected; specific measures are tailored to the circumstances of individual countries. The medium- and long-term objectives are to eradicate the disease progressively from the remaining "compartments" of infection and prevent its spread to those countries currently free of HPAI. This global strategy emphasizes a number of key points where action is required:

- ^{1.} Inadequate capacity is the main factor limiting the eradication of HPAI; capacity-building in terms of strong and sustainable human and physical resources needs to address all aspects of disease surveillance and control, policy development and socio-economic analysis.
- ^{2.} The dynamics of the rapid spread and persistence of HPAI remain unclear; research into the epidemiology of HPAI, evaluation of the efficacy of vaccines (especially in ducks), the development of improved vaccines and rapid diagnostic tests are all essential. In addition, analysis of production and marketing systems and the risks associated with them are required in order to target effective disease control, and restructuring of the poultry sector may be required in several countries.
- ^{3.} Country-specific projects will be formulated, under-pinned by three sub-regional HPAI support units developing harmonized technical standards and regional policies related to live-animal movement, compensation plans, capacity building, disease reporting requirements and poultry sector restructuring.

Economic analysis of these country-specific projects must take into account the unique nature of the problems to be solved. There are two main categories of economic impacts associated with outbreaks of infectious diseases such as HPAI in poultry and a potential human influenza pandemic:

- ^{1.} The economic consequences and costs of sickness or death resulting from the disease outbreaks; and
- ^{2.} The economic consequences and costs associated with public and private efforts to prevent the emergence or spread of the disease and to treat its effects.

These two are clearly related; for example, a greater effort at prevention and/or treatment for a given severity of epidemic would be expected to reduce the spread of sickness and/or the percentage of mortality and thus reduce the economic impact and costs.

There are also two "levels" of potential economic costs. The present spread of HPAI of the H5N1 strain involves transmission between animals and (so far) a limited incidence of transmission between animals and humans; as such, given the lethal nature of the virus, especially in poultry, it is principally an animal health crisis. However, the emergence of a human influenza pandemic caused by a lethal virus would have a social and economic impact many times greater. Obviously, the severity of the impact of this second "level" of economic costs would depend on the severity of the pandemic; in the "worst case" scenario it would have a truly devastating effect on human population and on the world economy.

Actions taken by any given country can be analyzed using the traditional "with project" and "without project" scenarios when the issue is to treat HPAI as an animal health issue. In this case, costs and benefits can be accurately quantified in some aspects and estimated in others. However, when actions are taken by a country in the wider context of the prevention or slowing down of a human influenza pandemic, this type of analysis begins to enter the realm of fantasy. By definition, no single country can protect itself against an influenza pandemic, and the importance of actions undertaken in one country may well have implications for the well-being of the rest of the world's population that are incalculable.

The economic costs of HPAI outbreaks in Asia have been limited at the macro-economic level but very high for specific sectors and communities. The costs so far incurred are mostly related to the death of poultry from the disease itself, the culling of poultry to stem its spread, and the costs to governments of containing the epidemic in terms of equipment, materials, transport and personnel. Ten Asian countries have had some sort of outbreak of HPAI, with around 140 million birds estimated to have been culled in the region as a whole. The direct economic costs of the outbreaks have been estimated at more than US\$10 billion.

In Vietnam, one of the most seriously affected countries, some 44 million birds or 17 percent of the total population of poultry, were culled at an estimated cost of US\$120 million (0.3 percent of GDP). The costs would have been substantially higher if there had been a serious impact on tourism, where an estimated 5 percent drop in tourist and business arrivals would reduce GDP by a further 0.4 percent. Fortunately, there has been only a small impact on tourism so far; the number of tourist arrivals in Vietnam increased by 20.5 percent in 2004 and rose further by 23 percent in the first seven months of 2005. Overall real GDP growth in Vietnam accelerated to 7.7 percent in 2004.

Although the overall macro-economic effects have been relatively small, the impact on the poultry sector and on associated input and distribution channels has been severe. An FAO survey indicates that in the most seriously affected parts of Indonesia more than 20 percent of permanent industrial and commercial farm workers lost their jobs. The FAO-OIE estimate that between one-third and a half of the populations in the most affected South East Asian nations derive at least some of their income from poultry production. In Vietnam, the poorest 60 percent of the population earn 6-7 percent of household income from this source and have been particularly at risk in terms of income losses.

The uncertainties and gaps in our knowledge about the scope and features of any future pandemic are extensive that a brief note such as this can only sketch some of main potential channels of impact. An important research priority for the future will be to undertake more formal analysis and modeling of economic impacts, building on previous work done for HIV-AIDS, SARS and other epidemics.

The effects of sickness and mortality on output: one main set of economic effects results from increased sickness and death among humans and their impact on the potential output of the world economy. Recent estimates suggest that the Spanish influenza of 1918/9 killed perhaps 50 million, or about 2.5 percent of the then world population of 1.8 billion. Today those proportions would mean 150 million deaths.

The most direct impact on output would be through the effect of increased illness and mortality on the size and productivity of the world labor force. In addition there will also be a general decline in labor productivity due to illness and sick leave among the labor force at large. Such productivity losses due to illness during normal annual influenza episodes are estimated to be ten times as large as all other flu-related costs combined. Other long-term impacts would play out as the increased costs of preventing and treating disease reduced savings and investment. The impact on output at the national level would vary widely, depending on the extent of the epidemic, the country's demographic structure, the extent of unemployed resources and other key variables.

Private preventive responses to an epidemic: Another set of economic impacts would result from the uncoordinated efforts of private individuals to avoid becoming infected or to survive the results of infection. Private individuals will take action to avoid infection, based on their perceptions of factors such as the disease's transmission mechanism, the probability of infection, the probability of death once infected, and the availability of preventive or curative measures.

The SARS outbreak in East Asia provides a good example. There were approximately 800 deaths - and thus no discernible impact on output - but actual economic losses were estimated at 0.5 percent of annual East Asian GDP in 2003, concentrated in the second quarter of the year, when there was a much sharper loss of around 2 percent of quarterly GDP. (Note that a 2 percent loss of global GDP during an influenza pandemic would represent around \$800 billion per year). Why such a severe economic loss? Given the spread of the disease through droplet transmission, people tried to minimize face-to-face interactions. The result was a severe demand shock for services sectors such as tourism, mass transportation, retail sales, hotels and restaurants. Business costs no doubt also increased due to workplace absenteeism, disruption of production processes and shifts to more costly procedures.

However, while such private actions were economically costly, they likely also played a role in breaking the chain of transmission of the disease. Thus an interesting policy question is how to minimize the ratio of costs to benefits of the inevitable private preventive actions that occur during an epidemic. Note that, at least initially, there was a dearth of public information about SARS, contributing to a large over-estimate by private individuals of the perceived probabilities of infection and death from SARS, a fact documented in opinion survey data. This could have led to over-reactions in the preventive actions taken by the population at large. One lesson from the SARS episode is that a prompt and transparent public information policy could help reduce the economic costs of an epidemic.

Public policy responses to epidemic threats: A last set of economic impacts are those associated with the policy efforts of the government to prevent the start of an epidemic, to contain the epidemic once it has begun, and to mitigate its harmful effects on the health of the population. These policy actions can be oriented towards the short, medium or long term, and, in spatial terms, towards national, regional or global levels. FAO-OIE (2005, *op. cit.*) elaborates policies to curb transmission among animals, including enhanced surveillance, diagnosis, bio-security measures, culling and vaccination of poultry. WHO (2005) sets out policies covering situation monitoring, assessment, prevention, containment and health system strategies during six stages before and during a human pandemic. These include, among many other measures, expanding production and targeted use of antiviral medicines and vaccines, as well as 'social distance measures' such as closures of schools and quarantines. Ferguson *et al* (2005) use a detailed simulation model of influenza transmission in Thailand to argue that targeted mass prophylactic use of antiviral medicines and social distance measures could halt a pandemic in its earliest stages.

All these public policy measures entail economic costs. Even though the human and economic benefits of preventing or containing an influenza pandemic are

overwhelming, governments may still be daunted by the cost of various policy measures, especially when these measures are in the nature of global public goods that benefit many more than just the citizens of that nation.

The cost of significantly scaling up anti-viral medicine and vaccine research and production would be a case in point. Thus careful economic analysis of different incentive schemes that could foster greater anti-viral medicine and vaccine production in efficient, cost-effective ways could make a large contribution in the effort to prevent or contain a pandemic.

Similarly, the use of blanket measures to curb movement within and between countries could cause major economic disruption due to the increasingly globalized nature of modern production processes. Again, careful analysis of critical logistical chains in the world economy could allow consideration of targeted prophylactic use of antiviral medicines to protect transport and other key groups of workers.

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